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Knowing the Technology: Considerations Before Implementation

TAXICAB EQUIPMENT REQUIREMENTS: CONSIDERATIONS FOR RULEMAKING

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SUMMARY

In recent years, there has been a proliferation of new vehicle equipment including digital security camera systems, GPS (Global Positioning System) vehicle locator systems, MDT (Mobile Data Terminal) for computer dispatch, alternative fuel vehicles (CNG and gasoline-electric hybrids), receipt-issuing taximeters, credit/debit card swipes, rooftop LED advertising, and wheelchair accessible taxicabs. Cities normally regulate taxicab equipment by publishing rules with specification or performance standards. Taxicab equipment may be required to address a variety of considerations: improved taxicab service (e.g., shorter response times, printed receipts), better driver/passenger safety (surveillance systems, vehicle location information), increased industry revenue (advertising revenue, more convenient method of payment), or simply to meet public policy goals (cleaner air, transportation for the disabled). Taxicab equipment is becoming more complex with computer technology applications but often there is no discernible industry standard for the regulator to reference in a rulemaking process. In the absence of existing industry standards, it may be appropriate for the International Association of Transportation Regulators, perhaps in consultation with the Taxicab, Limousine and Paratransit Association (TLPA), to publish voluntary model rules. This paper proposes a voluntary model rule for digital security camera systems for consideration by the IATR.

DISCLAIMER. This presentation was written by Craig Leisy of the Consumer Affairs Unit in Seattle, WA to promote discussion of this important issue among taxicab regulators at the annual conference of the International Association of Transportation Regulators (IATR) in Niagara Falls, Ontario, Canada during September 2005. He is solely responsible for any errors that it may contain. The presentation does not represent the views of the City of Seattle.

TAXICAB ELECTRONIC EQUIPMENT - OVERVIEW

There has been a virtual (no pun intended) landslide of new taxicab electronic equipment introduced in the past decade that utilize computer technology. Here are a few examples:

COMPUTER DISPATCH AND GPS

A computer dispatch system, using MDT (Mobile Data Terminals) with GPS (Global Positioning System)[1], has replaced radio dispatch in nearly every large taxicab fleet today. Even small taxicab fleets can use a web-based AVL (Automatic Vehicle Location) system that provides substantially the same features. The taxicab environment, which used to be rather noisy with dispatch radio chatter, is quiet since drivers use text messaging on the MDT. Computer dispatch has many advantages over radio dispatch. Most importantly, computer dispatch minimizes service response times by offering trips to taxicabs lined up in a virtual taxi stand within each geographical zone. This insures that only taxicabs that are available for hire (meter off) and located in the zone (GPS location) are assigned to trips. The availability of detailed electronic records on all trips make it possible for taxicab companies, and drivers, to know what time of day each zone is the busiest so that they can plan to meet the demand. These records can also be used for financial management, reporting service information to regulators, and investigating passenger complaints. GPS, which is the basis of computer dispatch systems, also contributes to improved driver safety with its tracking ability. Police can be directed to the exact location of a taxicab driver who is in trouble using real time GPS information.

Some regulators have adopted rules requiring the installation of GPS equipment for driver safety. A few cities have allowed the taxicab industry the option of installing safety partitions (shields), security cameras, or GPS. GPS vehicle locator systems made computer dispatch systems practical. Surprisingly, the purchase and installation of computer dispatch systems has largely been a taxicab industry initiative to improve efficiency. All computer dispatch systems are pretty similar. Call takers enter service requests in the computer and the computer offers trips to the next taxicab in the queue in that zone or an adjacent zone. Special attributes can be assigned to trips so that only certain taxicabs (e.g., wheelchair accessible) can accept them. Drivers can prompt the computer to call the passengers with the estimated arrival times. Computer records don't capture as much information as driver trip sheets but they are more accurate – times for service request, meter on and meter off as well as each the origin location of each trip are generally recorded.

[1] The Global Positioning System (GPS) consists of 24 satellites (incl. 3 spares) in orbit more than 10,000 miles above the Earth. The satellites orbit the Earth twice in 24 hours. There are 4 satellites above the horizon at all times so that geographic positions may be triangulated by GPS receivers on the ground. Originally developed for the Department of Defense as NAVSTAR (Navigation System with Timing and Ranging) as an all-weather navigation system, GPS has been adapted to many civilian applications including locator systems for all kinds of motor vehicle fleets.

There are several considerations for adoption of a rule requiring installation of computer dispatch or GPS. The primary consideration is cost-benefit comparisons by for-profit privately owned taxicab companies. GPS installation for improved driver safety requires a base station (usually the dispatcher) to monitor taxicab movements. AVL systems, using GPS, only require a desktop computer with internet connections to monitor taxicabs. The host web site usually charges for the GPS equipment and a per vehicle monthly fee (pays for "airtime") that depends on how many "locatings" are requested. MDT with GPS can cost a taxicab owner $1,500 or more. Computers, servers, monitors, printers, GPS, and software can cost a 100-taxicab company $120,000 plus $4,000 per month for equipment maintenance and software upgrades. The benefits of computer dispatch, discussed previously, are substantial. Generally, taxicab companies with large taxicab fleets (more than 100 taxicabs) purchase computer dispatch systems but even smaller fleets have installed these systems.

RECEIPT-ISSUING TAXIMETERS

Small electronic taximeters mounted on the dashboard with red LED displays are found in every taxicab.[2] Only NTEP (National Type Evaluation Program) taximeters may be installed according to weights and measures law in most states. The taximeters are tested by a metrology lab accredited by the National Conference on Weights and Measures (NCWM) using Section 5.54, "Taximeters", of the National Institute of Standards and Technology (NIST) Handbook 44 *Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices (2005).* The NCWM issues a Certificate of Conformance to taximeters that meet this standard.[3]

Considerations by regulators are limited to whether the taximeters should issue printed paper receipts. The information that must be printed on these receipts are specified by NIST Handbook 44 – e.g., ID number (e.g., Yellow 123), date, trip start time, trip end time, distance traveled, fare, additional charges (e.g., extras, surcharges), and total fare.[4] Receipt-issuing taximeters can cost $100 more than a basic taximeter. Nearly every other retail transaction involves providing the customer with a receipt. It is professional and builds customer confidence since all transactions are a matter of record. Taximeter receipts help advertise the taxicab company (providing that the service was satisfactory). Receipts also help taxicab companies and regulators with investigations of passenger complaints since drivers often don't log all trips on their handwritten trip sheets (sometimes computer dispatch records are better since they document all trips where the meter in switched on and off). Arguments against taximeter receipts often include the assertions that many passengers don't want receipts for taxicab trips and many trips may not be run with the taximeter on (no receipt) – e.g., airport flat rate trips, contract trips.

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[2] A notable exception is Washington, D.C. where a system of zone fares are used in lieu of taximeters.
[3] The link to the NCWM/NIST "Taximeter" standard is http://ts.nist.gov/ts/htdocs/230/235/h44-05/PDF/5.54-H44-05-Z.pdf A list of NTEP taximeters is available at the following link: http://ts.nist.gov/ts/htdocs/230/235/h44-05/PDF/5.54-H44-05-Z.pdf
[4] NIST Handbook 44, S.1.9.

A consideration when adopting taximeter code and rule requirements is to require taximeters to be "on" whenever taxicabs are transporting passengers or packages even if the trips are paid under a separate contract or are covered by a flat rate. Unless all trips are captured, there will not be a printed receipt and the taximeter statistics will undercount actual paid trips, paid miles, and fares. Undercounting can cause significant errors if these statistics are used by regulators and lawmakers to make decisions about taximeter rate increases and issuance of additional taxicab licenses.

TAXICAB EQUIPMENT (OTHER THAN ELECTRONIC) – OVERVIEW

In addition to electronic equipment, taxicabs have been changed considerably by the availability of other technology. Some are discussed here.

WHEELCHAIR ACCESSIBLE EQUIPMENT

Many large cities have adopted a requirement that a minimum number of taxicabs be wheelchair accessible. This requirement addresses public policy considerations regarding making public transportation, even though privately owned, accessible to persons confined to mobility devices. These public policy considerations always carry more weight than cost-benefit calculations. Normally, the only questions is "how many?" The objective is often to provide persons in mobility devices with "equivalent" service.

Equipment costs (up to $10,000 or more for lift platforms or low floor minivans with folding ramps) and operating costs (additional insurance, driver random drug testing, special driver training, door-to-door service) can be considerable but drivers cannot charge disabled passengers more than taximeter rates for wheelchair trips as provided by the Americans with Disabilities Act of 1990 (ADA 90). Equipment requirements are specified at 49 CFR 38.21-38.39 "Buses, Vans and Systems." One concern is how to verify that equipment manufacturers meet technical specifications contained in the federal regulations. Examples include: platform (38.23(b)) and ramp (38.23(c)) design loads and safety factors as well as design load of securement devices (38.23(d)). Perhaps even more important than equipment requirements are driver training in sensitivity to different disabilities and making proper tie downs. Another consideration is that ADA 90 only requires interlocks for vehicles with lift arrangements – not ramp installations (38.23(b)(2)). Interlocks prevent vehicle movement while the driver is loading/unloading or securing passengers – for example the lift cannot be operated unless the vehicle transmission is in locked in "park" and an audible alarm sounds if the interlock isn't engaged. A busy driver can forget to take these safety precautions.

ALTERNATIVE FUEL EQUIPMENT

Some cities have required that taxicabs serving the airports must be modified to use compressed natural gas (CNG) or another alternative fuel in order to reduce air pollution. CNG Ford Crown Victoria sedans are not being produced by the original equipment manufacturer anymore. Modified vehicles are not considered as good. Few used CNG vehicles are available. CNG cannot be compressed from a gas to a liquid like propane so

CNG cylinders take up a lot of space in the trunk and the range of these vehicles is reduced unless extra cylinders are installed for extended range. Often, luggage has to be placed in the front seat so these taxicabs are limited to three passengers in the back seat This can present a significant problem for taxicabs servicing the airport or cruise ship terminal. Finally, there are generally few fueling stations available for CNG.

As with wheelchair accessible vehicles, the decision to require alternative fuel vehicles is frequently based on public policy considerations. The question here too is "how many?" Available hybrid vehicles are generally too small to be useful as taxicabs but several cities are experimenting with them. Hybrids are also very costly compared with gasoline powered ex-police vehicles purchased at auction.

TAXICAB ADVERTISEMENTS

In the past, taxicab advertisements were generally limited to a sign behind the trunk or a rooftop mechanisms with static displays. Today, there are many types of advertisements used including window screens, body wraps, and hubcap covers. Each type raises new issues for consideration. For example, state law may specify light transmittal standards that would rule out the use of window screens. These screens can significantly limit the distance of visibility of the driver at night. Moreover, the police want to be able to see into a vehicle when approaching from the rear – especially taxicabs that may be crime scenes. Body wraps may obscuring the color scheme and markings of taxicabs. Hubcap covers may distract other drivers. Rooftop advertising mechanisms can have moving displays that are lighted and flashing using LEDs. These displays can distract other drivers.

Many taxicab codes, which were written many years ago, don't specifically address taxicab advertising. As a result, regulators often feel unable to prevent the use of advertisements. A related issue is the content of advertisements. Some advertisements can carry messages about tobacco products that may conflict with local ordinances regarding tobacco advertisements near schools. Other advertisements can be objectionable like the complaint we received about a taxicab with a rooftop ad for an adult entertainment club and including photos which showed up at a church to make a pickup. It isn't legal to limit content of advertisements so consideration should be given to limiting the use of advertisements on taxicabs. The removal of rooftop advertising mechanisms would reduce revenue for the taxicab owner in a small way (e.g., $50 per month) but would not affect driver earnings.

PROPOSED MODEL RULE – DIGITAL SECURITY CAMERA SYSTEMS

Often, taxicab regulators spend a lot of time "reinventing the wheel" when it comes to researching and writing code and rule requirements. This is as true with taxicab equipment as with anything else. Detailed industry standards would lessen the need for separate research but often there is none. A clear example of "reinventing" by taxicab regulators is digital security camera systems. It is equally clear that this could be

prevented if a "model rule" was developed and recommended by the IATR – perhaps in consultation with the TLPA.

DIGITAL SECURITY CAMERA SYSTEMS

During the past five years, a growing number of large cities in the U.S. and Canada have required taxicabs to install some equipment for driver safety. The cities in the eastern half of the U.S. and Canada required safety partitions or shields before security cameras were on the market and they are slowly converting to security cameras. The cities in the western half of the U.S. and Canada have, for the most part, favored security cameras. Comparisons of the two products aren't very productive since they do different things. It may be helpful to conceptualize the problem of driver safety.[5] If you think of taxicab driver safety as before-during-after then you are faced with the issues of prevention-protection-prosecution. Taxicab safety partitions are most effective in protecting a driver from physical attacks from passengers in the rear seat. They are less useful in preventing a crime against a driver and of no use in prosecuting a suspect following a crime. Security cameras, by contrast, are most effective in identifying, arresting and prosecuting suspects using images recorded by the cameras mounted on the windshield above the rearview mirror. Cameras are also considered pretty effective preventing crimes because signs warn all passengers that their images are being recorded for use by the police. Cameras are of no use in protecting a driver during the commission of a crime.

Digital security camera systems record images of all occupants in the taxicab with a wide angle lens and even record images in very low light conditions using infrared LEDs for illumination. These are single black-and-white images without sound. Usually the memory card, secured in a separate control unit, has a capacity of 4,000-8,000 images (128 MB or 256 MB flash memory cards). This should be adequate for 4 days of operations for a double shifted taxicab depending on the number of triggers and image sequences associated with them. The camera head mounts on the windshield between the rearview mirror and the head liner. The control unit with the memory card is normally installed beneath the dash board. Software for viewing images may be proprietary or protected with software passwords or coded hardware keys. Generally, access to viewing images is strictly limited to the police for the investigation of crimes. The police may be required to obtain a warrant to gain access to the USB plug connector for viewing images on their laptop computers. Alternatively, they may remove the memory card as evidence but this is not normally done with most assault or robbery crimes.

There are several concerns when drafting rules regarding the installation of digital security camera systems in taxicabs. There are technical issues and cost considerations but perhaps the greatest concern is driver and passenger reaction to the loss of privacy. The technical issues alone can be overwhelming to the layman. The regulator must become familiar with terms like "pixels", "resolution", "flash memory card", "triggers", and "image timing sequence." Despite specification of minimum technical standards for

[5] For much of this discussion I am indebted to Justin Dune who conducted considerable research on digital security camera systems, including side-by-side testing of products, for the city of Portland, OR during 2004.

images, rulemakings must also include more descriptive performance standards that require the image to be satisfactory for the use intended i.e., use by local police for identification, arrest, and prosecution of suspects in taxicab crimes. These specification and performance standards could be thought of as standards for "inputs" and "outputs." Taxicab digital security camera systems can cost $400-$500 per unit plus $100 for installation (usually 1-2 hours). The expected lifespan of cameras is 4-6 years depending upon use (probably twice the average lifespan of vehicles). They can be transferred to another vehicle as needed.

The privacy issue is the key consideration generally. Drivers are worried that camera images will be used by taxicab companies to spy on them - record their relations with passengers or to monitor their driving. Drivers are usually independent contractors and they resent a camera staring them in the face. Passengers are upset that a normally private environment like the back seat of a taxicab is being recorded and may become a public record. The privacy issue in taxicabs is very different than the use of surveillance cameras in retail stores and other public areas. The concerns of the public can be mitigated by explaining the effectiveness of security cameras in improving driver safety and by limiting the extent of the invasion of privacy. For example, the invasion of privacy can be minimized by limiting the access to images to the police and only to investigate crimes (perhaps requiring the police to obtain warrants) – not for routine investigations such as passenger complaints or fare run outs, providing good security for memory containing images (proprietary software, hardware keys, software passwords), limiting the memory capacity (memory is constantly recorded over), "sunset provisions" to require regular review of the effectiveness of cameras, and explaining that the images are stills (not video) and that there is no sound.

PROPOSED MODEL RULE

Most professional associations undertake other services besides information sharing and networking such as the publication of voluntary standards and model rules. Taxicab regulators are always drafting rules to implement changes to their taxicab codes. Rulemaking pertaining to taxicab equipment can be problematic since there are often several considerations - technical, legal, economic, and public policy. Some of these considerations may be in conflict and often are. Where clear industry standards are not available, the taxicab regulator is under greater pressure in drafting effective rules. The good news is that a few taxicab regulators somewhere have already done research on nearly every subject. What is needed is collaboration among these "experts", and with the taxicab industry, to develop a set of generic model rules (not technical standards) so that they may be shared among all taxicab regulators. This would not only benefit the taxicab regulator searching for a widely accepted standard but it would benefit industries that manufacture the taxicab equipment.

The IATR could sponsor this work by identifying subject matter experts and setting aside time before or after the annual conference for work on these model rules. Select representatives from the TLPA and equipment manufacturers could be invited to

participate also. Much of the preliminary work on early drafts of the model rules could be done via email and phone conferencing.

As a practical matter, taxicab regulators already "borrow" ideas and text from each other's rules. However, the result is still rules that can vary considerably from city to city and are not especially helpful to equipment manufacturers. Model rules promote uniformity and help reduce the cost of equipment. Model rules endorsed by professional organizations like the IATR, TLPA and associations of equipment manufacturer would be more readily accepted by all parties and by the public.

By way of illustration, I am attaching a copy of a recent rulemaking by the City of Seattle regarding digital security camera systems for taxicabs.[6] It borrows heavily from similar rules in Portland, British Columbia, Winnipeg, Toronto, Minneapolis, and New York. The image resolution standards are based upon comprehensive side-by-side testing and evaluation of the best existing equipment conducted by the City of Portland. Some important lessons have already been learned by the first cities to install security cameras and these will be very valuable in drafting a model rule. I propose that the IATR accept this challenge and begin with digital security camera systems.

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